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UNIONIDAE OF THE RIO GRANDE (RIO BRAVO DEL NORTE) SYSTEM OF TEXAS AND MEXICO

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ABSTRACT. The Rio Grande Subprovince is redefined as being limited to the Rio Grande System of Texas and Mexico. Fifteen species of Unionidae occur there. *Quadrula couchiana* (Lea), the recently described *Disconaias conchos* Taylor, and *Potamilis metnecktayi* Johnson, bring the total number of endemic Unionidae to three. *Truncilla macrodon* (Lea), formerly regarded as endemic, is placed in the synonymy of *T. donaciformis* (Lea). Of the twelve species that occur north of the Rio Grande, only two, *Popenaias popei* (Lea) and *Cyrtonaias tampicoensis* (Lea), also occur in the Mexican Gulf Coastal Region.

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INTRODUCTION

The Rio Grande (Rio Bravo del Norte) System described herein is not only a political boundary between

Texas and Mexico but also is a faunal limit. Of the nearly 300 specific and subspecific taxa of the Unionoidea which comprise the North American fauna (Williams, *et al.*, 1992), only 15 occur in the Rio Grande system, and of these only two extend into the Mexican Gulf Coastal Region.

The purpose of this paper is to bring together all of the reliable records, Recent and fossil, which indicate the past and present distribution of the Unionidae in the Rio Grande System. Several papers, freely quoted herein, deserve special mention because they are based on rather extensive recent collecting. These include Metcalf (1982), and Neck and Metcalf (1988).

The Rio Grande (Map 1a) is more than 3,000 km, or some 1,850 miles in length, and over 775 miles of it form the border between Mexico and Texas. It has its head in the San Juan Mountains of southern Colorado. It flows into New Mexico through basins comprising the Rio Grande Depression from which it exits below El Paso, Texas. Except for the introduction of *Anodonta grandis* Say to an artificial pond in El Paso, the only record of a living unionid north of this area is *Anodonta imbecillis* Say from the San Jose River (Map 1b), a tributary in central New Mexico. Tributaries in the upper part of the drainage have a relatively predictable flow, but downstream they become erratic. In the area of the Chihuahuan Desert the main channel itself is virtually dry between El Paso, Texas and the mouth of the Rio Conchos near Presidio, Texas.

The Rio Conchos (Map 1e) has its origin in the Sierra Madre Occidental, Mexico and flows northeastward across the Chihuahuan Desert to the Rio Grande. Only *Disconaias conchos* Taylor has been reported from it. The largest tributary of the Rio Grande is the Pecos River (Map 1c) which originates in the glaciated Sangre de Cristo

Mountains in northern New Mexico and flows southeast to enter the Rio Grande east of Langtry, Texas; somewhat above the Amistad Reservoir. The only living unionid found in the Pecos above Lake McMillan Reservoir (Map 1d) is *Popenaias popei* (Lea) from the main channel of the Pecos and the North Spring River, both near Roswell, Chaves County, New Mexico. Below McMillan Dam in Eddy County, *Megaloniaias nervosa* (Rafinesque), *Quadrula couchiana* (Lea), *Quadrula mitchelli* (Simpson), *Cyrtonaias tampicoensis* (Lea), and *Potamilis metnecktayi* Johnson have been found as fossils. Those which have been found alive occur near the confluence of the Pecos with Rio Grande.

The Devils River (Map 1g), some 540 km, or 335 miles, in length and largely in Val Verde County, now flows into the Amistad Reservoir creating Devils Lake (Map 1f). Below the Reservoir, extending from south of Del Rio, Val Verde County, the Rio Grande extends to the Gulf of Mexico. It follows a flat to gently undulating plain, the gradient going from nearly 0.75 m/km near Del Rio to 0.2 m/km near Laredo, and approaches sea level at Brownsville. Las Moras Creek (Map 1h) to the east of Devils River heads 4 miles north of Brackettville and flows for 19 km, about 12 miles, through Kinney and Maverick counties into the Rio Grande between Del Rio and Eagle Pass. This small stream supported numerous unionid species and at least one endemic fish, *Dionda diaboli* (Smith and Miller, 1986: 475).

Some 24 km, or about 15 miles, below Laredo the Mexican Rio Salado (Map 1i) and its large tributary, the Rio Sabinas, flows into what is now the Falcon Reservoir (Map 1j) on the main channel of the Rio Grande. The last tributary, Rio San Juan (Map 1k), also Mexican, has been

dammed to form the Presa de El Azúcar (or M.R. Gomez) (Map 1m) and is entirely in Mexico. The coastal plain approaches sea level near Brownsville and the general area contains numerous resacas, former courses or channels of the river. During the multiple glaciations of the Pleistocene, sea level stood much lower than present, with the result that the shoreline of the Gulf of Mexico extended at least to the edge of the Continental Shelf. Many now independent drainages of the Gulf Slope were formerly connected in their extended lower base-leveled courses, thus facilitating the distribution of fishes (Smith and Miller, 1986: 476) and unionids. It should be mentioned that Gray (1919) *Gazetteer of the streams of Texas* is still an invaluable work on the water resources of Texas.

The Mississippian or "Interior Basin" Region is essentially as defined by Van der Schalie and Van der Schalie (1950, Map 1), but in the Gulf Coastal Region the subdivisions of Johnson (1972) and Neck (1982), who divided the Western Gulf Coastal Region into three biogeographical subprovinces, are recognized. (1) The Sabine Subprovince (map 1, 9-13) which, according to Vidrine, extends to the Calcasieu River System of Louisiana and includes the Sabine, Neches, Trinity, and San Jacinto river systems because of the occurrence of *Lampsilis satura*, *Potamilis amphichaena* and "the problematical species in the genera *Fusconaia* and *Pleurobema*" (Vidrine, 1993: 196).

(2) The Central Texas Subprovince (Map 1, 1-8) includes the Brazos, Colorado, Guadalupe, San Antonio, and Nueces river systems, as well as, the shorter coastal streams, (the San Bernard, Lavaca, Mission, and Aransas rivers) and the creeks draining into the Baffin Bay Basin. Neck (1982) mentioned that the Central Texas Subprovince

had four endemic species: *Quadrula aurea*, *Q. petrina*, *Lampsilis bracteata* and *Sphenonaias* [= *Quincuncina*] *mittelli*, but the latter also occurs in the Rio Grande Subprovince. The maps in Howells *et al.* (1996) indicate that *Quadrula houstonensis* and *Truncilla macrodon* are also endemic to the Central Texas Subprovince, though they are equivocal as to the validity of *houstonensis*. The latter is beyond the scope of the present paper, but *macrodon* is included in the synonym of *T. donaciformis*.

Howells *et al.* (1996: 62), following Neck (1984), placed *Lampsilis streckeri* Frierson in the synonymy of *Lampsilis bracteata* (Gould). Johnson (1980: 98, pl. 17. figs. 6-8) illustrated the type of *L. streckeri* from the Little Red River of Arkansas, and other specimens from Onion Creek, Texas were also figured. Johnson (1980) mistakenly regarded them all to be *Villosa vibex* (Conrad). Gordon and Kraemer (1984: 99) called attention to this egregious error and convincingly argued that *streckeri* was a distinct species exhibiting a disjunct distribution in the uplifts of the Ozark Mountains in Arkansas and the Edwards Highlands in Texas. Johnson (1978: 271, 274, map 2) had previously shown a similar disjunct distribution of *Truncilla curtisii* Frierson and Utterback [= *Epioblasma*³ (*Torulosa*) *florentina* (Lea)] and *Truncilla lefeveri* Utterback [= *Epioblasma* (*Torulosa*) *turgidula* (Lea)] both from the White River System below the Ozark Crest, and the Tennessee and Cumberland river systems on the Cumberland Plateau.

³ Bogan (1997), on the basis of locating specimens of the type species of both *Plagiola* and *Epioblasma*, convincingly indicated that *Epioblasma* should replace *Plagiola* as used by Johnson (1978).

Gordon and Kraemer (1984: 100) restricted the type locality of *L. streckeri* to the Little Red River, Clinton, Van Buren County, Arkansas, now inundated by Greer's Ferry Reservoir. The species is still extant in Archey and Middle forks of the Little Red River (Clarke 1987). Gordon and Kraemer (1984: 99) indicated that there is no reason to believe that *Villosa vibex* was ever found in the some 36 km, or 22 mile, long Onion Creek, which flows through Blanco, Hayes, and Travis counties, entering the Colorado River about 1.5 miles north of Garfield, Texas (Gray, 1919: 173).

Neck (1984) found only *Lampsilis bracteata* living in Onion Creek, but according to Howells *et al.* (1996: 62) the Texas Parks and Wildlife Department found no living unionids there in 1993. While apparently recently-extinct, *Lampsilis streckeri* Frierson, this relic of an ancient upper Colorado River fauna should be included among the other unionids of the Central Texas Subprovince.

(3) The Rio Grande Subprovince (Map 1, a-m) was described by Neck (1982: 38) as consisting of the Rio Grande, but its southern extention into Mexico was left unclear. Fifteen species of mussels occur in that basin (Table 1). He considered *Cyrtonaias tampicoensis*, which occurs from the Central Texas Subprovince through the Mexican Gulf Coastal Region to the state of Vera Cruz, to be of southern origin. Neck (1982) listed four species as not occurring north of the Rio Grande: *Popenaias popei*, *Quadrula conchiana*, *Disconaias fimbriata* (non Frierson = *Potamilis metnecktayi*) and *Truncilla cognata*. These unionids, except *P. popei*, recently discovered in the Colorado River system, and *T. cognata* (= *T. donaciformis*), are endemic to the Rio Grande System. *P. popei* is assumed to be of southern origin although it has now been found

north of the Rio Grande. It extends in the Mexican Gulf Coastal Region to the state of Vera Cruz. *D. fimbriata* and *salinasensis*, (non Simpson) are misidentifications of *Potamilis metnecktayi* Johnson. *Disconaias conchos* Taylor (1997), brings the total endemic species to three. The remaining twelve species, including the recently introduced *Potamilis purpuratus* (Howells *et al.* 1996: 100), are all of northern origin and do not extend south of the Rio Grande. Thus it is shown here that the Rio Grande Basin is the subprovince and the boundry between the Western Gulf coastal and Mexican Gulf coastal regions (see Table 1).

Strecker (1931), the first to list the Texas unionids, restricted his records to species found only on the Texas side of the Rio Grande, as did Murray and Roy (1968) in their later checklist. Howells, *et al.* (1996) do the same. The latter, in their distribution maps, show a number of records which they list as unpublished. These are sufficiently clear that the relevant ones are reported herein, being accurate at least to county. The distributional data are presented, in so far as possible, from the headwaters to mouth of the various river systems, often with the drainages of the larger tributaries treated separately. The river systems are arranged arbitrarily, from the Rio Grande either north or south but in the instance of *P. popei*, both north and south from it. The extensive collections of the National Museum of Natural History, Smithsonian Institution; Museum of Zoology, University of Michigan, Ann Arbor, Michigan; and, of course, the Museum of Comparative Zoology have been examined personally.

With the exception of *D. conchos* and *P. metnecktayi*, figures of the available type specimens of all the taxa described specifically from the Rio Grande, as well as several others, are included. Those described and figured

Table 1. Distribution of the fifteen unionid species of the Rio Grande system of Texas and Mexico.

	Texas North	Rio Grande	Pecos River	Rio Conchos	Devils River	Las Moras Creek	Rio Salado	Rio San Juan	Pesacas	Mexico South
<i>P. popei</i>	+	+	+	+	+	+	+	+		+
<i>C. tampicoensis</i>	+	+	+			+	+	+	+	+
<i>A. imbecillis</i>	+	+		+	+	+	+		+	
<i>T. parvus</i>	+	+			+	+			+	
<i>P. purpuratus</i>	+	+			+					
<i>A. grandis</i>	+	+	X						+	
<i>Q. apiculata</i>	+	+							+	
<i>M. nervosa</i>	+	+	X			+	+			
<i>T. donaciformis</i>	+	+					+			
<i>Q. mitchelli</i>	+		X		+	+	+			
<i>L. teres</i>	+		+			+	+		+	
<i>U. tetralasmus</i>	+						+		+	
<i>P. metnecktayi</i>		+	+				+			
<i>Q. couchiana</i>			X	+	+	+	+			
<i>D. conchos</i>				+			+			

(+) = Known records of distribution

(X) = Known only from fossil and semi-fossil records

by Lea were regarded as figured holotypes by Johnson (1974). Such a designation constitutes a valid lectotype selection under Article 746 of the International Code of Zoological Nomenclature (1985). Thus, these designations

now read: Lectotype ---- inadvertently selected by Johnson (----) as the “figured holotype.”

Not all of the common species are illustrated. During the preparation of this paper, The Texas Parks and Wildlife Department published *Freshwater mussels of Texas* by Howells, Neck and Murray (1996), a useful illustrated work, which is quoted here, usually as the first reference, because of its utility as a tool for identification. References to the identification manual, *The Freshwater mussels of Tennessee*, by Parmalee and Bogan (1998) are also included when applicable. In the present work, some of the data on the plate captions are not repeated elsewhere. The arrangement of the genera is based essentially on the work of Davis and Fuller (1981) and Lydeard *et al.* (1996).

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Marrian, proofread it. Dr. Alan R. Kabat is especially thanked for making numerous corrections and for discovering some significant omissions. Mr. Adam Baldinger, whose computer skills rendered the manuscript into printable form, is thanked profoundly. He also prepared the map, table and plates.

ABBREVIATIONS:

ANSP	Academy of Natural Sciences of Philadelphia, Pennsylvania
JANSP	Journal of the Academy of Natural Sciences of Philadelphia, Pennsylvania (second series)
LACM	Natural History Museum of Los Angeles County, Los Angeles, California
MCZ	Museum of Comparative Zoology, Cambridge, Massachusetts
PANSP	Proceedings of the Academy of Natural Sciences of Philadelphia, Pennsylvania
PAPS	Proceedings of the American Philosophical Society, Philadelphia, Pennsylvania.
PUSNM	Proceedings of the United States National Museum, Washington, District of Columbia
TAPS	Transactions of the American Philosophical Society, Philadelphia, Pennsylvania
UMMZ	Museum of Zoology, University of Michigan, Ann Arbor, Michigan
USNM	National Museum of Natural History, Smithsonian Institution, Washington, District of Columbia
UTEP	Department of Biological Sciences, The University of Texas at El Paso, El Paso, Texas.

SYSTEMATIC SECTION

Family UNIONIDAE Rafinesque, 1820

Subfamily ANODONTINAE Rafinesque, 1820

Genus *Anodonta* Lamarck, 1799

Type species: *Mytilus cygneus* Linnaeus, 1758; monotypic.

Hoeh's (1990) phylogenetic analysis suggested that the subgenera *Pyganodon*, *Utterbackia*, and *Anodonta* should be elevated to genera. Though he had certain reservations, some authors have followed his suggestion. As such a shift is inconsistent with nomenclatural stability, the three subgenera remain here as such.

Subgenus *Pyganodon* Crosse and Fischer, 1894

Type species: *Anodonta globosa* Lea, 1841; subsequent designation by Frierson (1927: 9).

***Anodonta (Pyganodon) grandis* Say, 1829**

Recent references

Anodonta grandis [complex] -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 36 with figs., p. 203 with color figs; Parmalee and Bogan, 1998, *Freshwater mussels of Tennessee*: p. 206, pl. 100, map 99.

Anodonta grandis Say -- Strecker, 1931: 8; Metcalf, 1982: 48, pl. 2, fig. 6; Neck and Metcalf, 1988: 261.

Anodonta grandis lugbris Say -- Strecker, 1931: 10.

Anodonta grandis bealei Lea -- Strecker, 1931: 10.

NOMENCLATORIAL REMARK.-- *Anodonta grandis* is a polytypic species whose synonymy includes some 39 nominal taxa (Parmalee and Bogan, 1998: 206-207).

DISTRIBUTION.-- Mississippian Region; Great Lakes, Canadian Interior Basin; and Gulf Coastal Region, to the Rio Grande System.

REMARKS.-- *Anodonta grandis* now appears to be restricted to the very lower portion of the Rio Grande. With the exception of a single lot from Cement Lake, El Paso, El Paso County, Texas (catalogued as *A. stewartiana* Lea, USNM 681635), no other unionids have been found in the main channel of the Rio Grande that far west. The Rio Grande is dry or merely a trickle between El Paso and Presido, Presido County above its confluence with the Rio de los Conchos, Mexico. Metcalf and Smartt (1972: 144) were undoubtedly correct to assume that this species has been introduced.

RECORDS

RIO GRANDE SYSTEM

RIO GRANDE DRAINAGE.-- *Texas*: Cement Lake, El Paso, El Paso Co. (USNM 681635 [introduced, not seen]).

PECOS RIVER DRAINAGE.-- *Texas*: banks of arroyo entering Billingslea Draw [near] Toyah, Reeves Co. [fossil] (Metcalf, 1982: loc. 6 [not seen]).

RIO GRANDE DRAINAGE.-- *Texas*: Granjeno Lake (Strecker, 1931: 10); canals from Rio Grande, Mercedes (Ellis *et al.*, 1930: 512 [as *A. linneana* Lea]); both Hidalgo Co.

Subgenus *Utterbackia* F.C. Baker, 1927

Type species: *Anodonta imbecillis* Say, 1829; original designation.

Anodonta (Utterbackia) imbecillis Say, 1829

(Plate 1, figure 1)

Recent references

Anodonta imbecillis Say -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 39 with figs., 204 with color figs.

Utterbackia imbecillis (Say) -- Parmalee and Bogan, 1998, *Freshwater mussels of Tennessee*: p. 242, pl. 122, map 121.

Anodonta ohiensis Rafinesque -- Strecker, 1931: 11.

Anodonta ohiensis horda Gould -- Strecker, 1931: 12.

Anodonta imbecilis [sic] Say -- Neck, 1987: 178; Neck and Metcalf, 1988: 261.

Relevant synonymy

Anodonta henryana Lea, 1857, *PANSP* 9: 102; 1860 *JANSP* (2) 4: 373, pl. 66, fig. 198 (Obs. *Unio* 9: 55). Lectotype USNM 86692 (Matamoros, [State of] Tamaulipas, Mexico) inadvertently selected by Johnson (1974: 69) as the "figured holotype."

DISTRIBUTION.-- Mississippian Region; Lake Superior (Graf and Underhill, 1997: 410) and other Great Lakes; Southern Atlantic Slope, Peninsular Florida; and Gulf Coastal Region, west to the Rio Grande System.

RECORDS

RIO GRANDE SYSTEM

RIO GRANDE DRAINAGE.-- *New Mexico*: San Jose River [near] San Rafael, Valencia Co. (Neck, 1987: 160, Corpus Christi Museum 78S092 [not seen]).

DEVILS RIVER DRAINAGE.-- *Texas*: Beaver Lake [on Devils River, 3 mi N Juno] (USNM); Devils River (Strecker, 1931: 11 [not seen]); both Val Verde Co.

LAS MORAS CREEK DRAINAGE.-- *Texas*: [Las Moras Creek] Fort Clark [= Brackettville], Kinney Co. (Strecker, 1931: 11 [not seen]).

SAN LORENZO CREEK DRAINAGE.-- *Texas*: San Lorenzo Creek [Webb Co.] (USNM).

RIO SALADO DRAINAGE.-- *State of Nuevo Leon, Mexico*: canal, 20.5 mi [ca. 34 km] WNW Anahuac (MCZ).

RIO GRANDE DRAINAGE.-- *Texas*: [Rio Grande] Zapata and Starr counties (Howells *et al.*, 1996: 49 [not seen]); Cottingham Resaca, 3.5 mi [ca. 6 km] N of Brownsville, Cameron Co. (MCZ). [State of] *Tamaulipas*; *Mexico*: [Rio Grande] Matamoros (USNM).

Subfamily AMBLEMINEAE Rafinesque, 1820

Genus *Megalonaias* Utterback, 1915

Type species *Unio heros* Say, 1829; original designation.

***Megalonaias nervosa* (Rafinesque, 1820)**

(Plate 1, figure 2)

Recent references

Megalonaias nervosa (Rafinesque) -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 80 with figs., p. 209-210 with color figs; Parmalee and Bogan, 1998, *Freshwater mussels of Tennessee*: p. 159, pl. 69, map 68.

Amblema gigantea (Barnes) -- Strecker, 1931: 34.

Megalonaias gigantea (Barnes) -- Metcalf, 1982: 46, pl. 1, fig. 7, pl. 2, fig. 7.

Relevant synonymy

Unio nervosa (*Elliptio nervosa*) Rafinesque, 1820. Ann. gén. des Sci. Physiques à Bruxelles 5 (15): (aux rapides de l'Ohio). Type lost.

Unio giganteus Barnes, 1823, *Amer. Jour. Sci.* 6: 119 (Mississippi [River], near Prairie du Chien [Crawford Co., Wisconsin]). Type destroyed by fire.

Unio eightsii Lea, 1860, *PANSP* 12: 306; 1860, *JANSP* (2) 4: 367, pl. 64, fig. 192 (Obs. *Unio* 8: 49). Lectotype USNM 83991 (Sabinas River, [State of] New [Nuevo] Leon, Mexico) inadvertently selected by Johnson (1974: 51) as the "figured holotype."

NOMENCLATURAL REMARKS.-- Rafinesque's taxon was resuscitated from the dust bin of unrecognizable descriptions by Morrison (1969: 24) who merely asserted "*Meglonaias nervosa* Raf. 1820 (= *gigantea* Barnes, 1823)." Oesch (1984: 76) quotes, from a personal note, Stansbery's reason for accepting Morrison's revelation. "The type specimen (actually figured) was a very small one (1.5 inches wide) and very elongate for this species. It is at this small size, however, that *M. nervosa* has the characters noted by Rafinesque, characters which are lacking in all other naiades of the region." It takes a great leap of faith to

accept Stansbery's identification based, as it is, on a very meager description and a wretched drawing.

DISTRIBUTION.-- Mississippian Region; Gulf Coastal Region to the Rio Grande System.

REMARKS. -- Most of the Rio Grande records are based on fossil material. *M. nervosa* is replaced in the Mexican Gulf Coastal Region by *Megaloniaias nickliniana* (Lea, 1834).

RECORDS

RIO GRANDE SYSTEM

PECOS RIVER DRAINAGE.-- *New Mexico*: Pecos River, below McMillan Reservoir; downstream from Fishing Rock; Pierce Crossing; all Eddy Co. [all Pleistocene and outside of present range] (all Metcalf, 1982: locs. 2-4 [not seen]).

LAS MORAS CREEK DRAINAGE.-- *Texas*: [Las Moras Creek] Fort Clark [Brackettville], Kinney Co. (Mearns, 1907: 77 as *Quadrula undulata* Barnes and as *Amblema plicata costata* Rafinesque Mearns by Strecker, 1931: 32 [not seen]).

RIO GRANDE DRAINAGE.-- *Texas*: [Rio Grande], Eagle Pass, Maverick Co. [fragment] (Metcalf, 19832: 46 [not seen]); Rio Grande, Chapeña, 2.3 km below Falcon Dam, Starr Co. [fresh shells] (Neck and Metcalf, 1988: 262).

RIO SALADO DRAINAGE.-- *State of Coahuila, Mexico*: sediments S bank Rio Salado, Municipio Villa Juarez (Metcalf, 1982: loc. 10 [not seen]). *State of Nuevo Leon, Mexico*: Sabinas River (USNM 83991); sediments of Rio Salado, 24 km S, Anahuac (Metcalf, 1982: loc. 11 [not seen]).

Genus *Quadrula* Rafinesque, 1820

Type species: *Obliquaria (Quadrula) quadrula* Rafinesque, 1820; tautonymy.

Quadrula apiculata (Say, 1829)

Recent references

Quadrula apiculata (Say) -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 105 with figures, pp. 212-213 with color figs.

Quadrula quadrula apiculata (Say) -- Strecker, 1931: 19; Metcalf, 1982: 47.

Quadrula apiculata speciosa (Lea) -- Neck, 1987: 178; Neck and Metcalf, 1988: 262.

DISTRIBUTION.-- Southern Mississippian Region; Mobile Basin; Gulf Coastal Region west to the Rio Grande System.

REMARKS.-- This species was reported from the Neuces River System in Lake Corpus Christi by Murray (1978: 5) as *Quadrula quadrula* (Rafinesque, 1820) and later from three additional localities along the Neuces River as *Q. apiculata* by Howells *et al.* (1996: 107, map). Neck (1987: 178) found a single valve further south in Dairy Lake, Llano Mesteño near Baffin Bay. Metcalf (1982: 47) suggested, that since this species had not been previously located in the Rio Grande System, it may represent an introduced population.

RECORDS

RIO GRANDE SYSTEM

RIO GRANDE DRAINAGE.-- *Texas*: Rio Grande, below Falcon Reservoir, Starr Co.; Lake Monte Alto, Hidalgo Co. (*both* Metcalf, 1982: 67 [not seen]). Resaca de los Fresnos, San Benito [Cameron Co.] (Neck and Metcalf, 1988: 262 [not seen]).

Quadrula couchiana (Lea, 1860)

(Plate 2, figure 1)

Recent references

Quadrula couchiana (Lea) -- Howells *et al.*, 1996, *Freshwater Mussels of Texas*: p. 39 with figs., p. 204 with color figs.; Strecker, 1931: 28; Metcalf, 1982: 47.

Relevant synonymy

Unio couchianus Lea 1860, *PANSP* 12: 305; 1860, *JANSP* (2) 4: 371, pl. 66, fig. 196 (Obs. *Unio* 8: 53). Lectotype USNM 85728 (Rio Salado, [State of] New [Neuvo] Leon, Mexico) inadvertently selected by Johnson (1974: 38) as the "figured holotype."

NOMENCLATURAL REMARK.-- This dwarf species was placed in *Quadrula* s.s. by Morrison (1968: 50).

DISTRIBUTION. -- Probably endemic to the Rio Grande System.

REMARKS.-- All of the records above Devils River in the Pecos River Drainage are based on semi-fossil specimens. The record from the Nueces River is thought to be spurious.

RECORDS

RIO GRANDE SYSTEM

PECOS RIVER DRAINAGE.-- *New Mexico*: Pecos River, below McMillan Reservoir; Pierce Crossing; both Eddy Co. [both Pleistocene, and outside of present range] (both Metcalf, 1982: locs. 2, 4 [not seen]). *Texas*: Pecos River, mouth of Hackberry Draw, Ward Co. [Pleistocene, and outside of present range] (Metcalf, 1982: loc. 5 [not seen]).

DEVILS RIVER DRAINAGE.-- *Texas*: Devils River [Val Verde Co.] (USNM).

LAS MORAS CREEK DRAINAGE.-- *Texas*: [Las Moras Creek], Fort Clark [= Brackettville], Kinney Co. (Strecker, 1931: 29 and MCZ 269875).

RIO SALADO DRAINAGE.-- *State of Coahuila, Mexico*: sediments S bank Rio Salado, Municipio Villa Juarez (Metcalf, 1982: loc. 10 [not seen]). *State of Nuevo Leon, Mexico*: sediments of Rio Salado, 24 km SE of Anahuac (Metcalf, 1982: loc. 11 [not seen]); Rio Salado (USNM).

NUECES RIVER SYSTEM

CHACON CREEK DRAINAGE.-- *Texas*: Chacon Creek, 1 mi below La Pryor (Eagle Pass Road, bridge), Zavalla Co. (Two bleached valves, USNM 524035 [not seen]); "These may be *Quadrula petrina* (Gould, 1855) which is similar." (Neck in Howells *et al.*, 1996: 110).

Genus *Quincuncina* Ortmann, 1922

Type species: *Quincuncina burkei* Walker, 1922; original designation.

***Quincuncina mitchelli* (Simpson, 1895)**

(Plate 2, figures 2,3)

(Plate 4, figures 1,2)

Recent references

- Quincuncina mitchelli* (Simpson) -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 127 with figs., p. 213 with color figs.
Elliptio tamaulipasensis (Conrad) -- Strecker, 1931: 18.
Elliptio tamaulipasensis elongata (Simpson) -- Strecker, 1931: 19.

Relevant synonymy

- Unio taumilipanus* Conrad, 1855, *PANSP* 7: 256. Type (San Juan River, Taumilapas [*sic*, State of] Tamaulipas, Mexico) not located (*teste* Johnson and Baker, 1973: 172); *nomen dubium*, *teste* Fischer and Crosse, 1894: 621 [as *Unio tamaulipasensis*, emendation]; Martens, 1900: 521 [as *Unio tamulipanus*]; Coney and Taylor, 1986, *Western Soc. Mal. Ann. Rept. for 1985* 18: 13 [as *Unio taumilapana*].
- Unio mitchelli* Simpson, 1895 in Dall, *PUSNM* 18: 5; 1896, *PUSNM* 19: 371, pl. 32, figs. 1-3. Lectotype USNM 128364 (Guadalupe River, Victoria Co., Texas) inadvertently selected by Johnson (1974: 15) as the "figured holotype."
- Unio iheringi* B.H. Wright, 1898, *Nautilus* 12: 93 (San Saba River, Menard Co., Texas). Lectotype USNM 152171 is the "type" figured by Simpson (1900, *PANSP* 52: 79, pl. 4, fig 5) regarded by Johnson (1967: 7) as "holotype."
- Unio mitchelli elongatus* Simpson, 1914, *Cat. naiades* 1: 623. Lectotype USNM 251917 (Guadalupe River [near Kerrville], Kerr Co., Texas) selected by Johnson (1975: 12, pl. 2, fig. 5).
- Quadrula (Quincuncina) guadalupensis* Wurtz, 1950, *Notulae Naturae* (224): 2, figs. 1-5. Holotype ANSP 185974 (Guadalupe River, above Sequin, between routes 123 and 90, Guadalupe Co., Texas).

NOMENCLATORIAL REMARKS.-- Coney and Taylor (1986: 12) pointed out, as previous authors had, that *Unio taumilapanus* [*sic*] was not sufficiently described to permit its application to any known species with certainty; it was not figured and the type is lost. Only Frierson (1927: 156) advocated its identity by placing *U. mitchelli* and other taxa

in its synonymy but without explanation. Coney and Taylor (1986) accepted *mitchelli* as the first available taxon and placed it in *Quincuncina* which they claimed was supported by both anatomical and shell characters. Howells *et al.* (1996: 127) were first to list the complete synonymy of *U. mitchelli*.

DISTRIBUTION.-- Brazos, Colorado, and Guadalupe river systems; Rio Grande System.

REMARKS.-- Most of the Rio Grande records are based on fossil material. *Q. mitchelli* has not been reported from the intervening Neuces River System.

RECORDS

RIO GRANDE SYSTEM

PECOS RIVER DRAINAGE.-- *New Mexico*: Pecos River, below McMillan Reservoir; Pierce Crossing; *both* Eddy Co. [*both* Pleistocene, and outside of present range] (*both* Metcalf, 1982: Locs. 2, 4 [not seen]). *Texas*: Pecos River, mouth of Hackberry Draw, Ward Co.; banks of arroyo entering Billingslea Draw [near] Toyah, Reeves Co. [fossil] (Metcalf, 1982: loc. 6 [not seen]).

RIO SALADO DRAINAGE.-- *State of Coahuila, Mexico*: Rio Salado, Villa Juarez [subfossil] (Metcalf, 1982: loc. 10 [not seen]). *State of Nuevo Leon, Mexico*. Rio Salado, Anahuac; China [*both* subfossil] (*both* Metcalf, 1982, locs. 11,12 [not seen]). *State of Tamaulipas, Mexico*: Rio Salado, 4.5 mi S of Nuevo Leon (UMMZ).

GUADALUPE RIVER SYSTEM

GUADALUPE RIVER DRAINAGE.-- *Texas*: Guadalupe River, Ingram; near Kerrville; *both* Kerr Co. (*both* USNM). Guadalupe River, near Comfort, Kendall Co. (Strecker, 1931: 18). Guadalupe River, Hueca Falls, 4 mi N of New Braunfels, Comal Co. (MCZ, USNM). Guadalupe River, Victoria Co. (MCZ).

COLORADO RIVER SYSTEM

COLORADO RIVER DRAINAGE.-- *Texas*: Santa Anna, Coleman Co. (USNM).

SAN SABA RIVER DRAINAGE.-- *Texas*: San Saba River, Menardville, Menard Co. (MCZ, USNM); San Saba River, San Saba Co. (UMMZ).

LLANO RIVER DRAINAGE.-- *Texas*: Llano River, Mason Co. (USNM).

BRAZOS RIVER SYSTEM

LITTLE RIVER DRAINAGE.-- *Texas*: Leon River, Gatesville, Coryell Co. (MCZ, USNM); Leon River, Bell Co. (UMMZ).

BRAZOS RIVER DRAINAGE.-- *Texas*: Brazos River (MCZ, USNM).

Subfamily PLEUROBEMINAE Hannibal, 1912

Genus *Popenaias* Frierson, 1927

Type species: *Unio popei* Lea, 1857; original designation.

Originally described as a subgenus of *Elliptio*, *Popenaias* Frierson (1927: 10, 38) also included *Elliptio metallicus* (Say, 1831) and *Elliptio metallicus ganinus* (Pilsbry, 1910). Heard and Guckert (1971: 399, 483) elevated *Popenaias* to a genus, limited to *Elliptio popei* (Lea, 1857) from Texas and *Elliptio buckleyi* (Lea, 1843) from peninsular Florida. They also created a new subfamily Popenaiadinae comprised of *Popenaias* and *Cyrtonaias* Cross and Fischer, 1893. Fuller (1975) subsequently determined that *Cyrtonaias* belonged to the Lampsilinae.

Popenaias popei (Lea, 1857)

(Plate 6, figure 1)

Recent references

Popenaias popei (Lea) -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 93 with figures, p. 211 with color figs.

Elliptio popei (Lea) -- Strecker, 1931: 17.

Popenaias popeii (Lea) -- Metcalf, 1982: 45; Neck and Metcalf, 1988: 45.

Relevant synonymy

Unio popeii Lea, 1857, *PANSP* 9: 102; 1860, *JANSP* (2) 4: 372, pl. 66, fig. 197 (Obs. *Unio* 8: 54). Lectotype USNM 85895 (Rio Salado, [State of] New [Nuevo] Leon, Mexico) inadvertently selected by Johnson (1974: 115) as the "figured holotype."

NOMENCLATURAL REMARK.-- *Unio veraepacis* Tristram (1864: 414) was mistakenly included in the synonymy of *P. popei* by both Frierson (1927: 38) and Howells *et al.* (1996: 93). The type of the former taxon, collected from the State of Vera Paz, Guatemala, was figured by Martens (1900:#516, pl. 38, fig. 1-1a) as a variety of *Unio ravistellus* Morelet, 1849.

DISTRIBUTION.-- Western Gulf and Mexican Gulf coastal regions. Colorado River System and from the Rio Grande System south to the Rio Cazodones System. State of Vera Cruz, Mexico.

RECORDS

COLORADO RIVER SYSTEM

COLORADO RIVER DRAINAGE. -- *Texas*: Concho River, 1991; collection of Angelo State University, San Angelo, Tom Green Co. [single specimen, *teste* Howells (personal communication) not seen].

LLANO RIVER DRAINAGE. -- *Texas*: Llano River, 1972; Museum of Biological Diversity, The Ohio State University, Columbus, Ohio [single specimen, *teste* Howells (personal communication) not seen].

RIO GRANDE SYSTEM

RIO GRANDE DRAINAGE.-- *Texas*: Rio Grande at San Francisco Creek, Brewster Co.; Rio Grande, Terrell Co. (*both* Howells *et al.*, 1996: 93, 211 with figs. [not seen]).

PECOS RIVER DRAINAGE.-- *New Mexico*: Pecos River, 4.5 mi NE of Roswell (USNM); North Spring River, Roswell [fresh specimens] (Cockerell, 1902: 69 [not seen]); sediments of Rio Felix (Metcalf, 1982: loc. 1) [not seen]; *all* Chaves Co. Pecos River, below McMillan Reservoir [Pleistocene] (Metcalf, 1982: loc. 2 [not seen]); Pecos River, Carlsbad, ANSP 174028; *both* Eddy Co. *Texas*: Pecos River, mouth of Hackberry Draw [Pleistocene] (Metcalf, 1982: loc. 5 [not seen]); Pecos River (Strecker, 1931: 17 [not seen]); *both* Ward Co. Lagoon in Deadman Canyon [ca. 13 mi up stream from mouth of Pecos River, living specimens], ANSP 85268 [not seen], Val Verde Co.

DEVILS RIVER DRAINAGE.-- *Texas*: Devils River (USNM, UMMZ); lower end of Blaines Lake, a widening of Devils River (Strecker, 1931: 17 [not seen]); *both* Val Verde Co.

LAS MORAS CREEK DRAINAGE.-- *Texas*: Las Moras Creek, Fort Clark [= Brackettville], Kenney Co. (Strecker, 1931: 17; MCZ 295007).

RIO SALADO DRAINAGE.-- *State of Coahuila, Mexico*: Sediments S bank, Rio Salado, Municipio Villa Juarez (Metcalf, 1982: loc. 10 [not seen]). *State of Nuevo Leon, Mexico*: Sediments of Rio Salado, 24 km S Anahuac (Metcalf, 1982: loc. 11 [not seen]; Rio Salado (USNM).

RIO GRANDE DRAINAGE.-- *Texas*: Rio Grande below Falcon Dam, Chapeño, Starr Co. (Neck and Metcalf, 1988: 262 [not seen]); Keller Resaca, Brownsville, Cameron Co. (Neck, 1987: 160, Corpus Christi Museum 785078). *State of Neuvo Leon, Mexico*: E side, Rio San Juan, China [probably Holocene] (Metcalf, 1982: loc. 12 [not seen]).

RIO SOTA DE MARINA SYSTEM

RIO SOTA DE MARINA DRAINAGE.-- *State of Tamaulipas, Mexico*: Rio Corona, 3.5 mi E of Guémez (UMMZ); Rio Purificacion, near Padilla (MCZ); Rio Sota de Marina, 4 mi SW of Padilla (MCZ).

RIO TAMESI SYSTEM

RIO SABINAS DRAINAGE.-- *State of Tamaulipas Mexico*: Rio Sabinas, E of Gomez Frias (UMMZ).

RIO GUAYALEGO DRAINAGE.-- *State of Tamaulipas Mexico*: Rio Guayalejo, 19 mi ENE of Ciudad Mante; near Magiscatzin (*both* MCZ).

Rio Panuco Drainage.-- *State of San Luis Potosi, Mexico*: Rio Frio 2.7 mi W of Rescon; Valles River, Mecos Falls, Mecos; Valles; between Valles and Pojal (*all* MCZ).

RIO CAZONES SYSTEM

RIO CAZONES DRAINAGE.--*State of Vera Cruz, Mexico*: Rio Cazones, 2.5 WSW of Poza Rica, Vera Cruz [State] (MCZ).

Genus *Uniomereus* Conrad, 1853

Type species: *Unio tetralasmus* Say, 1831; subsequent designation by Simpson (1900: 739).

Unio merus tetralasmus (Say, 1831)

(Plate 6, figure 2)

Recent references

- Unio merus tetralasmus* (Say) -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 149 with figs., p. 218 with color figs.; Neck, 1987: 151; Parmalee and Bogan, 1998, *Freshwater mussels of Tennessee*: p. 240, pl. 121, map 120.
- Unio merus declivis* (Say) -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 147 with figs., p. 218 with color figs.; Parmalee and Bogan, 1998, *Freshwater mussels of Tennessee*: p. 239, pl. 120, map 119.
- Elliptio tetralasmus* (Say) -- Strecker, 1931: 14.
- Elliptio declivis* (Say) -- Strecker, 1931: 14.
- Elliptio tetralasmus manubius* (Gould) -- Strecker, 1931: 16.
- Unio merus tetralasmus manubius* (Gould) -- Neck and Metcalf, 1988: 261.

Relevant synonymy

- Unio manubius* Gould, 1855, *Proc. Bos. Soc. Nat. Hist.* 5: 229. Lectotype MCZ 169447 (Chihuahua, 60 mi from Camp Ringgold = Rio Agualeguas, Puntigudo, ca. 3 mi NE of General Trevino, State of Nuevo Leon [Mexico]; *teste* Taylor, 1966: 154) inadvertently selected by Johnson (1964: 239, pl. 32, fig. 5) as "measured holotype."

NOMECLATURAL REMARK.-- Johnson (1970a: 339) may have erred in regarding *U. tetralasmus* as a single polytypic species as determined by Morrison (1976: 10) who regarded populations east of the Apalachicola River System of Georgia and Alabama as *Unio merus carolinianus* (Bosc, 1801). Morrison (1976) accepted the argument of Frierson (1903) that *declivis* (= *manubius*) was distinct from *tetralasmus*; however, the distribution of the former was taken to be "Lake Erie drainage, Ohio and Indiana; from Tennessee; from the Coosa River system in Alabama, and southwest across Texas to the south side of the Rio Grande System in Chihuahua, Mexico." Morrison also claimed that while *declivis* is gonochoristic, "*tetralasmus* individuals all

possess the female type of gill structure, and hence are evidently either parthenogenetic or hermaphroditic.”

Frierson (1903) recognized *declivis* as a distinct species, only from the Gulf Coastal Region, which is more pointed posteriorly, smaller in general, with a purplish nacre; that of *tetralasmus* always being white. He also stated that *declivis* is found in rivers, whereas *tetralasmus* invariably lives in the “small streams and ponds of the south.” If *declivis* is not more than a phenotypic variant of *tetralasmus*, the shape of the type specimens of *manubius* would appear to place that taxon under the synonymy of *declivis* except that the types have a white nacre.

DISTRIBUTION.-- Mississippian Region; Great Lakes; Southern Atlantic Slope, Peninsular Florida; Gulf Coastal Region, to the lower Rio Grande System.

REMARKS.-- Referring to the record, cited below, from the Rio Grande Drainage, Neck (1987: 151) stated, “No form of *Uniomerus* is known today from the lowland, heavy clay areas of the Lower Rio Grande Valley. The Camp [collection] shells have a blunted posterior ventral projection. The periostracum is yellowish horn brown with obvious growth rings, although there is no indication of long periods of habitat desiccation.” He further remarked on the similarity between the Camp shells, though larger, and the type of *manubius*.

RECORDS

RIO GRANDE SYSTEM

RIO SALADO DRAINAGE.-- *State of Nuevo Leon, Mexico*: Chihuahua, 60 mi from Camp Ringgold [= Rio Agualeguas, Puntiaquedo, ca. 3 mi NE of General Treniño], (MCZ 169447, MCZ 169448).

RIO GRANDE DRAINAGE.-- *Texas*: Cottingham Resaca, Brownsville, Cameron Co. (Neck, 1987: 160, Corpus Christi Museum 785056 [not seen]).

Subfamily LAMPSILINAE Ortmann, 1912
Genus *Cyrtonaias* Crosse and Fischer, 1894

Type species: *Unio berlandierii* Lea, 1834; original designation.

Originally introduced by Crosse and Fischer (1894: 556) as a section of *Unio*, *Cyrtonaias* was accepted as a subgenus of *Lampsilis* by Frierson (1927: 11, 84) and as a genus by Fuller (1975: 81) who wrote, "*Cyrtonaias* is considered to be the most primitive known representative of the Longenae, the most primitive lampsiline tribe."

Cyrtonaias tampicoensis (Lea, 1838)

Recent references

- Cyrtonaias tampicoensis* (Lea) -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 48 with figures, p. 205 with color figures; Metcalf, 1982: 50, pl. 1, fig. 4. Johnson, 1998, *Occ. Pap. on Moll.*, 5(76): pl. 23, fig. 2, pl. 24, figs: 1, 2.
- Lampsilis tampicoensis* (Lea) -- Strecker, 1931: 41.
- Lampsilis tampicoensis berlandieri* (Lea) -- Strecker, 1931: 42.
- Cyrtonaias tampicoensis berlandieri* (Lea) -- Neck and Metcalf, 1988: 262.
- Lampsilis tampicoensis heermani* (Lea) -- Strecker, 1931: 42.

Relevant synonymy

- Unio tampicoensis* Lea, 1838, *TAPS* 6: 24, pl. 7, fig. 18 (Obs. *Unio* 2: 24). Lectotype USNM 84843 (River Tampico, Mexico) inadvertently selected by Johnson (1974: 143) as the "figured holotype."
- Unio tecomatensis* Lea, 1841, *PAPS* 2: 30; 1842, *TAPS* 8: 234, pl. 21, fig. 48 (Obs. *Unio* 3: 72). Lectotype USNM 85338 (Tecomate River, near Tlocatalpam, [Tlacatalpan, State of Vera Cruz], Mexico) inadvertently selected by Johnson (1974: 144) as the "figured holotype."
- Unio grandensis* Conrad, 1855, *PANSP* 7: 256. Type (Rio Grande, Texas) not located in the ANSP by Johnson and Baker (1973: 157). Without a figure and with only the most brief of descriptions, Simpson (1900: 588) placed this taxon in the synonymy of *Gebula rotundata* (Lamarck, 1819) but noted that that species had never been found so far west. Since this is still

true, Howells *et al.* (1996: 59) suggested Conrad's species is probably *C. tampicoensis*.

Unio berlandierii Lea, 1857, *PANSP* 9: 101; 1860, *JANSP* (2) 4: 369, pl. 65, fig. 194 (Obs. *Unio* 8: 51). Lectotype USNM 84427 ([Rio Grande,] Metamoras, [State of Tamaulipas] Mexico) inadvertently selected by Johnson (1974: 20) as the "figured holotype."

Unio saladoensis Lea, 1860, *PANSP* 12: 305; 1860, *JANSP*(2) 4: 370, pl. 65, fig. 195 (Obs. *Unio* 8: 52). Holotype [by monotypy] (Rio Salado, State of New [Nuevo] Leon, Mexico) lost.

Unio heermanii Lea, 1861, *PANSP* 13: 392; 1862, *JANSP*(2) 5: 194, pl. 26, fig. 263 (Obs. *Unio* 9: 16). Lectotype USNM 83932 (Medina River, [San Antonio River System,] Texas) inadvertently selected by Johnson (1974: 69) as the "figured holotype."

Lampsilis tampicoensis kusteriana Frierson, 1927, *Check List of North American Naiades*: p. 85. Based on the figure of Kuester, 1862, Martini and Chemnitz, *Conchylien Cabinet* 2(9): 275, pl. 93, fig. 1. Type (Tampico, [State of Tamaulipas] Mexico) in the collection of Von dem Busch, the location of which is unknown; refigured by Johnson (1972b: 145, pl. 30, fig. 1).

DISTRIBUTION.-- Western Gulf and Mexican Gulf Coastal regions; originally from the Brazos River System south to the Rio Cotaxla System, State of Vera Cruz, Mexico.

REMARKS.-- Not reported north of the Brazos River System, Texas by Strecker (1931: 41, 71), this species appears to have been subsequently introduced to more northern river systems. Found in the San Jacinto River System in 1957 at Lake Creek, near Spring, Harris Co. (MCZ 222661); the Trinity River System (Howells *et al.*, 1996: 48); and the Red River System at Texoma, Texas and Oklahoma (Mather, 1989).

RECORDS

RIO GRANDE SYSTEM

PECOS RIVER DRAINAGE.-- *New Mexico*: sediments of Rio Felix, Chaves Co.; Pecos River, below McMillan Reservoir; downstream from Fishing Rock; Pierce Crossing; *all* Eddy Co. [*all* Pleistocene and outside of present range] (*all* Metcalf, 1982: locs. 1-4 [not seen]). *Texas*: Pecos River, mouth of Hackberry Draw; SW of

Grandfalls; *both* Ward Co.; near Imperial, Pecos Co.; WNW of Imperial, Crane Co. [*all* Pleistocene and outside of present range] (*all* Metcalf, 1982: locs. 5, 7-9 [not seen]). Pecos River, above mouth of Big Fielder Draw [living specimens] (Metcalf, 1982: loc. 15 [not seen]); lagoon in Deadman Canyon [ca. 13 km upstream from mouth of Pecos River] [living specimens] (ANSP 85265 [not seen]); Pecos River, 1.28 km above mouth [living system] (Metcalf, 1982: loc. 17 [not seen]); *all* Val Verde Co.

RIO GRANDE DRAINAGE.-- *Texas*: Rio Grande, 9.7 km W of Del Rio, Val Verde Co. [living specimens] (Metcalf, 1982: loc. 18 [not seen]).

PINTO CREEK DRAINAGE.-- *Texas*: Pinto Creek, Kinney Co. (USNM).

LAS MORAS CREEK DRAINAGE.-- *Texas*: [Las Moras Creek,] Fort Clark [= Brackettville], Kinney Co. (Strecker, 1931: 42 [not seen]).

ELM CREEK DRAINAGE.-- *Texas*: Elm Creek, near Eagle Pass, Maverick Co. (USNM).

SAN ISABELL CREEK DRAINAGE.-- *Texas*: [San Isabell] Creek, 10 mi NW of Laredo, Webb Co. (MCZ).

RIO GRANDE DRAINAGE.-- *Texas*: Falcon Lake [of Rio Grande], 8 mi S of Zapata (MCZ); Arroyo Valeno (USNM); *both* Zapata Co.

RIO SALADO DRAINAGE.-- *State of Coahuila, Mexico*: Rio Sabinas (MCZ, USNM); sediments S bank, Rio Salado, Municipio Villa Juarez (Metcalf, 1982: loc. 10 [not seen]). *State of Nuevo Leon, Mexico*: Rio Salado, Lampasas (ANSP 44201 [not seen]); Rio Salado, Anahuac (MCZ). *State of Tamaulipas, Mexico*: Rio Salado, 4.5 mi S of Nuevo Laredo (UMMZ).

RIO SAN JUAN DRAINAGE.-- *State of Nuevo Leon, Mexico*: Rio San Juan, Monterey (UMMZ); E side, Rio San Juan, China [probably Holocene] (Metcalf, 1982: loc. 12 [not seen]). *State of Tamaulipas, Mexico*: [Rio San Juan], Camargo (USNM).

RIO GRANDE DRAINAGE.-- *Texas*: [Arroyo Colorado,] Mercedes, Hidalgo Co. (MCZ, USNM); [Arroyo,] 2 mi SW Harlingen (USNM); Puljivate Resaca, Brownsville (Neck, 1987: 160 [not seen]); *both* Cameron Co. *State of Tamaulipas, Mexico*: Rio Grande, Matamoras (USNM).

RIO CONCHOS (OR RIO SAN FERNADNO) SYSTEM

RIO CONCHOS DRAINAGE.--*State of Tamaulipas, Mexico*: Rio Conchos (USNM, LACM 105551).

RIO TAMESI SYSTEM

RIO SABINAS DRAINAGE.-- *State of Tamaulipas, Mexico*: Rio Sabinas, E of Gomes Farias (UMMZ).

RIO GUAYALEJO DRAINAGE.--*State of Tamaulipas, Mexico*: Rio Guayalejo, 19 mi ENE of Ciudad Mante (MCZ).

RIO PANUCO DRAINAGE.--*State of Vera Cruz, Mexico*: Rio Panuco, Panuco (MCZ); Rio Tampico, [Panuco] (USNM).

RIO COTAXLA SYSTEM

RIO COTAXLA DRAINAGE.--*State of Vera Cruz, Mexico*: Rio Medellín, 10 mi S of Vera Cruz (USNM).

RIO PAPALOAPAN SYSTEM

RIO PAPALPOAPAN DRAINAGE.--*State of Vera Cruz, Mexico*: Rio Tecomate, near Tlacotalpan (USNM).

Genus *Potamilus* Rafinesque, 1818

Type species: *Unio alatus* Say, 1817; subsequent designation (Morrison, 1969). Placed on the Official List of Generic Names in Zoology (1992, Bulletin of Zoological Nomenclature **49** (1): 81), replacing the well-known taxon *Proptera* Rafinesque 1819. The case is closed, but for a historical discussion of it: see Johnson (1980: 128).

Potamilus metnecktayi Johnson, 1998

Recent references

Lampsilis salinasensis Metcalf *non* Simpson, 1982, in Davis, *Proc. Symposium Recent Benthological Investigations in Texas and Adjacent States*: p. 48, pl. 2, fig. 2.

Potamilus salinasensis Neck and Metcalf *non* Simpson, 1988, *Texas Jour. Sci.* **40**: 262; Howells *et al.* *non* Simpson, 1996, *Freshwater mussels of Texas*: p. 103 with figs., p. 212 with color figs.

Potamilus (Disconaias) salinasensis Howells and Garrett *non* Simpson, 1995, Triannual Unionid Report (8): [10].

Relevant synonymy

Potamilus metnecktayi Johnson, 1998, *Occ. Pap. on Moll.*, **5** (76): 429, pl. 22, figs. 1, 2.

DISTRIBUTION.--Lower Rio Grande System.

RECORDS

RIO GRANDE SYSTEM

RIO GRANDE DRAINAGE.-- *Texas*: Rio Grande at Boquillas Canyon (Howells and Ashby, 1999 [not seen]) and at San Francisco Creek (Howells *et al.*, 1996: 103), *both* Brewster Co.

PECOS RIVER DRAINAGE.-- *New Mexico*: Pecos River, below McMillan Dam, Eddy Co., [Pleistocene, outside present range] (Metcalf, 1982: loc. 2, [not seen]). *Texas*: mouth of Pecos River, at former US 90 bridge (now flooded by Amistad Reservoir), Val Verde Co. (Taylor *et al.*, July 1968 [not seen]).

RIO GRANDE DRAINAGE.-- *Texas*: Rio Grande, 6 mi W of Del Rio, Val Verde Co. (Metcalf, October 1972, UTEP 2519). Rio Grande, Chapengo gaging station (Metcalf, December 1975: UTEP 4660 [not seen]); Rio Grande, Roma (Metcalf, December 1975: UTEP 4639 [not seen]); *both* Star. Co.

RIO SALADO DRAINAGE.-- *State of Coahuila, Mexico*: sediments S bank, Rio Salado, Municipio Villa Juarez (Metcalf, 1982: loc. 10, UTEP 4844 [not seen]). *State of Tamaulipas, Mexico*: Rio Salado, 45 mi S Nuevo Laredo (M. M. Ellis, July 1929, UMMZ 66993). *State of Nuevo Leon, Mexico*: Rio Salado, Lampozos (ANSP 44200 [not seen]).

***Potamilus purpuratus* (Lamarck, 1819)**

Recent references

Potamilus purpuratus (Lamarck) -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 100 with figures, pp. 211-212 with color figs; Johnson 1998, *Occ. Pap. on Moll.*, 5 (76): pl. 23, fig 1; Parmalee and Bogan 1998, *Freshwater mussels of Tennessee*: p. 199, pl. 96, map 95.

Proptera purpurata (Lamarck) -- Strecker, 1931: 44.

DISTRIBUTION.-- Mississippian Region, Gulf Coastal Region, formerly not extending beyond the Guadalupe River System, Texas. Recently found in the Rio Grande System. Howells *et al.* (1996: 102) suggested that these records may represent an introduced population.

REMARKS.-- Earlier published records of *P. purpuratus* from the Rio Grande System have been shown to be misidentified specimens of *Crytonaias tampicoensis*.

Howell *et al.* (1996: 100) reported that *P. purpuratus* collected in 1993 from Lake Corpus Christi, Live Oak Co., Texas from the Nueces River System (between the Guadalupe River and Rio Grande systems) were from an introduced population.

RECORDS

RIO GRANDE SYSTEM

RIO GRANDE Drainage.-- *Texas*: Amistad Reservoir, Val Verde Co. (Howells *et al.*, 1996: 102 [not seen]).

DEVILS RIVER Drainage.-- *Texas*: Devils River, Val Verde Co. (Howells *et al.*, 1996: 102 [not seen]).

Genus *Disconaias* Crosse and Fischer, 1894

Type species: *Unio discus* Lea 1838; original designation

Originally described by Fischer and Crosse (1894: 556) as a section of *Unio*, *Disconaias* was elevated to a subgenus of *Actinonaias* by Baker (1922: 20) and to a genus by Taylor (1997: 420).

Disconaias conchos Taylor, 1997

Recent reference

[Not identified] Howells, 1994, Info. Mussel Newsletter, 2(11) p. 5, figs.

Relevant synonymy

Disconaias conchos Taylor, 1997, *Occ. Pap. on Moll.* 5(75): 420, pl. 21, fig. 1. Holotype LACM 2257 (Rio Conchos, about 0.5 km W of Julimes, State of Chihuahua, Mexico).

DISTRIBUTION.-- Endemic to the Rio Conchos and Rio Salado drainages of the Rio Grande System.

RECORDS

RIO GRANDE SYSTEM

RIO CONCHOS DRAINAGE.-- *State of Chihuahua, Mexico*: Rio Conchos, 15 km NE of Saucillo (LACM 69-240.2); 1 km N of Rosetilla (LACM 69-242.1); 1.5 km NW of Rosetilla (LACM 69-243.1); *all* worn valves. Rio Conchos, about 1.2 km W of Julimes (LACM 69-239.1).

RIO SALADO DRAINAGE.-- *State of Coahuila, Mexico*: Rio Sabinas, Villa Juarez (LACM 95117).

Genus *Lampsilis* Rafinesque, 1820

Type species: *Unio ovatus* Say, 1817; subsequent designation by Herrmannsen (1849: 575).

***Lampsilis teres* (Rafinesque, 1820)**

Recent references

Lampsilis teres (Rafinesque) -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 69 with figures, p. 207 with color figs.; Strecker, 1931: 37; Metcalf, 1982: 50; Neck and Metcalf, 1988: 236; Parmalee and Bogan, 1998, *Freshwater mussels of Tennessee*: p. 136, pl. 54, map 53.

NOMENCLATORIAL REMARKS.-- Howells *et al.* (1996: 69) do not claim that the occasionally more or less green-rayed form of *Lampsilis teres* occurs in Texas. They do discuss, however, its taxonomy and synonymy which was misunderstood by Oesch (1984: 208) who changed what had been called *Lampsilis teres fallaciosa* (Smith, 1899) to *L. teres teres* (Smith, 1899). The typical yellow, unrayed form he changed from *L. teres teres* (Rafinesque, 1820) (which would be the correct name if there was also a valid subspecies) to *L. teres anodontoides* (Rafinesque, 1820). Actually, *Unio anodontoides* Lea, 1834 is an unrayed shell and as such is a synonym of *Unio teres* Rafinesque, 1820.

The rayed form occurs sporadically as a phenotypic variant and is not a geographically isolated subspecies. For this reason, it was rejected by Johnson (1972: 242) and Vidrine (1993: 149) as a mere subspecies. If it were one, it would be known as *Lampsilis teres fallaciosa* (Smith, 1899), as mentioned above.

DISTRIBUTION.-- Mississippian Region; Peninsular Florida; Apalachicola Region; Mobile Basin; Gulf Coastal Region, west to the Rio Grande System.

RECORDS

RIO GRANDE SYSTEM

- PECOS RIVER DRAINAGE.-- *Texas*: Lagoon in Deadman Canyon, ca. 13 km upstream from mouth of Pecos River (ANSP 85267 [not seen]); Pecos River, 28 km above mouth [1986, before inundation by Amistad Reservoir] (D.W. Taylor, personal communication [not seen]); *both* Val Verde Co.
- LAS MORAS CREEK DRAINAGE.-- *Texas*: [Las Moras Creek,] Fort Clark [= Brackettville], Kinney Co. (Strecker, 1931: 50 [not seen]).
- ELM CREEK DRAINAGE.-- *Texas*: Elm Creek, north of Eagle Pass, Maverick Co. (Metcalf, 1982: 50 [not seen]).
- RIO GRANDE DRAINAGE.-- *Texas*: Rio Grande, Loredo, Webb Co. (Strecker, 1931: 38 [not seen]); Falcon Reservoir, 8 mi S of Zapata, Zapata Co. (MCZ).
- RIO SALADO DRAINAGE.-- *State of Coahuila, Mexico*: Rio Sabinas (MCZ). *State of Nuevo Leon, Mexico*: sediments of Rio Salado, 24 km S of Anahuac (Metcalf, 1982: Loc. 11 [not seen]).
- RIO GRANDE DRAINAGE.-- *Texas*: Resaca, Mercedes, Hidalgo Co. (MCZ). *Texas*: Cottingham Resaca, Brownsville (Neck, 1987: 160, Corpus Christi Museum 87S054 [not seen]); Resaca, 4 mi E of Brownsville (MCZ); *both* Cameron Co.

Genus *Toxolasma* Rafinesque, 1831

Type species: *Unio lividus* Rafinesque; by elimination [=subsequent designation], Frierson (1914: 7). Ortmann and Walker (1922: 54-55) showed *U. lividus* to be a *nomen dubium* and stated that therefore *Toxolasma* must

disregarded. Nevertheless, on the mere statement of Morrison (1969: 24) that "*Toxolasma livida* Raf. 1831 (= *glans* Lea, Dec. 1831)," Valentine and Stansbery (1971: 29) resurrected this generic name, claiming that it has priority over *Carunculina* (see Johnson, 1972: 230).

Toxolasma has been subsequently used in place of *Carunculina* by most authors; thus it is now employed here in the supposed interest of stability.

***Toxolasma parvus* (Barnes, 1823)**

(Plate 3, figure 3)

(Plate 4, figures 1-3)

(Plate 5, figures 1-3)

Recent references

Toxolasma parvus (Barnes) -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 131 with figs., p. 216 with color figs.; Neck and Metcalf, 1988: 263; Parmalee and Bogan, 1998, *Freshwater mussels of Tennessee*; p. 232, pl. 115, map 114.

Toxolasma texasensis (Lea) -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 133, with figs., p. 216 with color figs.; Parmalee and Bogan, 1998, *Freshwater mussels of Tennessee*; p. 233, pl. 116, map 115.

Carunculina parva texasensis (Lea) -- Strecker, 1931: 45.

Carunculina parva compressa (Simpson) -- Strecker, 1931:47.

Carunculina parva mearnsi (Simpson) -- Strecker, 1931: 47.

Relevant synonymy

Unio haleianus Lea, 1842, *TAPS* 8: 247, pl. 27, fig. 63 (Obs. *Unio* 3: 85). Holotype USNM 85306 (only specimen) [male] ([Red River,] Alexandria, [Rapides Parish, Louisiana]).

Unio texasensis Lea, 1857, *PANSP* 9: 84; 1860, *JANSP*(2) 4: 359, pl. 61, fig. 184 (Obs. *Unio* 8: 41). Lectotype USNM 85302 [male] ([Guadalupe River,] Dewitt Co., Texas) inadvertently selected by Johnson (1974: 145) as the "figured holotype."

Unio bairdianus Lea, 1857, *PANSP* 9: 102; 1860, *JANSP* (2) 4: 361, pl. 61, fig. 186 (Obs. *Unio* 8: 43). Type lost (Devils River, [Val Verde Co.,] Texas); probable syntype MCZ 316413, male

specimen thought to be the one mentioned by Lea as from "Mississippi" in the J.G. Anthony collection.

Unio beali Lea, 1862, *PANSP* 14: 169; 1862, *JANSP*(2) 5: 204, pl. 30, fig. 273 (Obs. *Unio* 9: 26). Lectotype USNM 85305 [male] ([Trinity River,] Leon Co., Texas) inadvertently selected by Johnson (1974: 19) as the "figured holotype."

Lampsilis texasensis compressus Simpson, 1900, *Proc. USNM* 22: 564; 1914, *Cat. naiades* 1: 150. Lectotype USNM 152059 [male] (southwest Texas) selected by Johnson (1975: 11, pl. 1., fig. 5 from Las Moras Creek, Fort Clark [= Brackettville, Kinney Co.], Texas).

Lampsilis mearnsi Simpson, 1900, *PANSP* 52: 75, pl. 1, fig. 4. Lectotype USNM 151549 [female] (vicinity of Fort Clark [= Brackettville, Kinney Co.], Texas) inadvertently selected by Johnson (1975: 14) as the "figured type;" allotype USNM 151549. The label now gives the locality as, "Elm Cr. 27 [corrected from 20] mi from Fort Clark." Mearns (1907: 75), in his description of Station 2, makes no mention of Elm Creek (now Pinto Creek) flowing into the Rio Grande west of Fort Clarke or Elm Creek to the east, an intermediate tributary to the Nueces River. His description of Station 2 does, however, mention that the head of Las Moras Creek is at Fort Clark and at a pool about 20 mi south of the Fort, *Alligator mississippiensis* Daudin was taken. Mearns was at Fort Clark from November 1892 - July 1893, and again from November 1897 - June 1898. Topotypes MCZ 87962 from Mearns, ca. 1898, are more precisely labeled as "pool, 20 mi S. Fort Clark, Kinney Co., Texas," and the type locality is here so restricted.

NOMENCLATORIAL REMARKS.-- Call (1896) monographed "the *parvus* group of Unionidae," placing in synonymy many of the described taxa. While he retained *texasensis* as a species, he appears to have done so with some reluctance stating, "this form illustrates the erection of a species name upon characters that are but an expression of sex." *Toxolasma parvus* was reported from resacas on the lower Rio Grande by Neck and Metcalf (1988: 263) where specimens were said to "vary from slightly yellow brown to dark brown in color." Vidrine (1993: 169) regarded *parvus* as a creek species which showed very little sexual dimorphism and had a relatively smooth periostracum,

whereas *texasensis* was a species of larger rivers, lakes, and ponds that exhibited considerable sexual dimorphism and had a rough periostracum.

Specimens throughout the range of *parvus* have been identified as *texasensis*. Parmalee (1967: 61), for example, after describing *texasensis* from Illinois, suggested that it "is quite similar to *Carunculina parva*, only larger, and it may be only a form or variant." The three localities he gave for it (North Fork Saline River, Galatin Co.; Big Muddy River and Crab Orchard Lake, both in Williamson Co.) provide soft-substrate habitats; these are where the largest specimens, measuring 2.25 inches in length were collected. This suggests an environment similar to that mentioned for *texasensis* by Vidrine (1993).

In addition to *Unio bardianus* (female) and *U. beali* (male) which, like *U. texasensis* were described from Texas, and *U. haleianus* from Louisiana, there are two additional ecophenotypes described by Simpson. These, from the most southern extension of the range of *T. parvus*, were named as *Lampsilis texasensis compressus* and *L. mearnsi*. Both were from Las Moras Creek, a tributary of the Rio Grande, Texas. The former, from the headwaters of the creek has a thin, compressed shell with a yellowish-green to light brown periostracum. It was reported by Strecker (1931: 47) as being most abundant in small streams fed by springs in the southwestern part of Texas.

It will be noted that *mearnsi* was from a "pool," some distance from the headwaters of Las Moras Creek. Specimens have a heavy, inflated shell with a yellowish-green to light brown periostracum. Strecker (1931: 47) reported it as also from the Medina River, Medina Dam, and several other localities in the San Antonio River System [none of these seen]. Two specimens, MCZ 235490 from

the Nueces River System, Lake Corpus Christi, Mathis, San Patricio Co., Texas, resemble closely the type of *mearnsi*. Howells (1997: 32), using specimens from the Nueces River System that he regarded as *mearnsi* and specimens from the Colorado River System north to the Neches River System, determined as *texasensis*, concluded, on the basis of electrophoretic analyses, that *mearnsi* "has yet to display genetic differences to distinguish it from *T. texasensis*." However, on the basis of *T. parvus* from the Falcon Reservoir, further south on the Rio Grande, Howells also suggested that, "although the number of specimens and enzyme systems has been limited, these preliminary data suggest *T. parvus* and *T. texasensis* are clearly distinct." The specimens he examined from the reservoir might be thought of as coming from a pond on a large river. It could have been expected that they, like other samples studied, would prove to be *texasensis*. *Toxolasma parvus* is regarded here as a single variable species to which *texasensis* is but one of the several nomina that have been applied to specimens from the Rio Grande.

DISTRIBUTION.--Mississippian Region; Great Lakes into western New York state, west to Minnesota, southern Canada; Peninsular Florida; Apalachicolan Region; Gulf Coastal Region west to the Rio Grande System.

RECORDS

RIO GRANDE SYSTEM

DEVILS RIVER DRAINAGE.-- Texas: Devils River, [Val Verde Co.] (*Unio bairdianus* Lea; USNM).

LAS MORAS CREEK DRAINAGE.-- Texas: Las Moras Creek [headwaters], Fort Clark [= Brackettville] (*Lampsilis texasensis compressus* Simpson; USNM MCZ); [pool] ca. 20 mi S of Fort Clark [= Brackettville] (*Lampsilis mearnsi* Simpson; USNM, MCZ); both Kinney Co.

RIO GRANDE DRAINAGE.-- *Texas*: Falcon Reservoir, [Zapata Co.] (Howells, 1997: 32 [not seen]); Resacas, lower Rio Grande (Neck and Metcalf, 1988: 263 [not seen]).

Genus *Truncilla* Rafinesque, 1820

Type species: *Truncilla truncata* Rafinesque, 1820; subsequent designation by Herrmannsen (1849: 628).

Truncilla donaciformis (Lea)

(Plate 7, figures 1-6)

Recent references

Truncilla donaciformis (Lea) -- Howells *et al.*, 1996, *Freshwater mussels of Texas*: p. 141, with figs., p. 217 with col. figs.; Strecker, 1931: 48; Parmalee and Bogan, 1998, *Freshwater mussels of Tennessee*: p. 236, pl. 118, map 117.

Truncilla macrodon (Lea) -- Howells *et al.* 1996. *Freshwater mussels of Texas*: p. 143, with figs., p. 217 with col. figs.; Strecker, 1931: 48.

Truncilla cognata non Lea, 1860 -- Howells *et al.* 1996, *Freshwater mussels of Texas*: p., 139 with figs, pl. 217 with col. figs. [first figure identified as *T. macrodon*]; Metcalf, 1982: 48.

Plagiola cognata (Lea) -- Simpson 1914, *Cat. naiades* 1: 310.

Relevant synonymy

Unio donaciformis Lea, 1828, TAPS 3: 267, pl.4, fig. 3 (Obs. Unio 1: 9). Lectotype USNM 84457 (Ohio) inadvertently selected by Johnson (1974: 49) as the "figured holotype."

Unio zigzag Lea, 1829, TAPS 3: 440, pl. 12, fig. 19 (Obs. Unio 1: 54). Type lost (Ohio).

Unio macrodon Lea, 1859, PANSP 11: 154; 1863, JANSP (2) 5: 193, pl. 26, fig. 262 (Obs. Unio 9: 15) Holotype [based on two opposing valves] USNM 25711 ([Colorado River] Rutersville [Fayette Co.], Texas).

Unio cognatus Lea, 1860, PANSP 12: 306; 1860, JANSP(2) 4: 368, pl. 65, fig. 193 (Obs. Unio 8:50). Holotype USNM 85004 (single valve only) (Rio Salado [State of] New [Nuevo] Leon, Mexico).

NOMENCLATORIAL REMARKS.-- In the first attempt to revise these taxa, introduced by Issac Lea, and now placed

in *Truncilla*, Simpson (1900: 605) admitted to the difficulty in separating *donaciformis* and *macrodon*. He later wrote (1914: 309) of *donaciformis* that, "the pattern of coloring varies greatly, there being shells with unbroken rays...and that rarely the shell is a uniform ashy or dirty yellowish green. It is generally more inflated than *macrodon*, but it is quite probable that it gradually merges with that species in the southwest," though he (1914: 310) did concede that "*macrodon* was, less inflated and rather longer than *donaciformis*, the color patterns less vivid and [the shell] not quite as sharply pointed behind. The female shell especially is quite blunt." Strecker (1931: 48), with more material at his disposal, claimed that while typical specimens of *donaciformis* were rare in Texas, it probably intergraded with *macrodon*. While Howells *et al.* (1996: 32) regarded *macrodon* as an endemic species confined to central Texas, they also admitted (p. 142) that their concept of the validity of *truncata*, *macrodon*, and *cognata* may be questionable. The validity of *T. truncata*, a distinct and widely distributed species (see: Vidrine, 1993: 184, pl. 18, figs. P-Y, maps 130-131), is not questioned. The specimens figured by Howells, *et al.* (1996: 139) as *cognata*, *donaciformis*, and *macrodon*, as well as those mentioned by Metcalf (1982: 48), are thought to be *donaciformis*. It is a widely distributed species, the shell of which is variable and shows sexual dimorphism. *T. cognata* was based on a single old valve, and Simpson (1914: 310) described it as being close to *macrodon* and *donaciformis*, but mentioned that the shell was heavier and more inflated than either of them. His description was based on the type and an additional left valve from the Rio Salado Drainage (Plate 7, fig. 4),

subsequently identified as *macrodon*. *T. cognata* is regarded here as merely an old specimen of *donaciformis*.

DISTRIBUTION. -- Mississippian Region; Great Lakes: Michigan and Erie; Mobile Basin; Gulf Coastal Region west to the Rio Grande.

RECORDS

RIO GRANDE SYSTEM

RIO GRANDE DRAINAGE.-- *Texas*: Rio Grande, 9.7 km W of Del Rio (Metcalf, 1982: loc. 18 [MCZ]); Rio Grande (Howells *et al.*, 1996: 139, figs.); *both* Val Verde Co. Rio Grande, Eagle Pass, Maverick Co. (Metcalf, 1982: 48 [listed as *cognata*, not seen]).

RIO SALADO DRAINAGE.--*State of Nuevo Leon, Mexico*: Rio Salado (Holotype of *U. cognatus*, USNM 85004); Rio Salado, 10 km W of Anahuac [fossil specimens] (Metcalf, 1982: 48 [not seen]. *State of Tamaulipas, Mexico*: Rio Salado, near Nuevo Larado (USNM 85004a and 257105).

GUADALOUPE RIVER SYSTEM

GUADALOUPE RIVER DRAINAGE.-- *Texas*: Wimberly Lake, Hayes Co. (MCZ); Guadalupe River, Victoria Co. (USNM).

COLORADO RIVER SYSTEM

CONCHOS RIVER DRAINAGE.-- *Texas*: Conchos River, Tom Green Co. (Howells *et al.*, 1996: 144 [listed as *macrodon*, not seen]).

LLANO RIVER DRAINAGE.-- *Texas*: Llano River, Mason Co. (Strecker, 1931: 48 [listed as *macrodon*, not seen]); Llano River, Bessemer Co. (USNM).

COLORADO RIVER DRAINAGE.-- *Texas*: Colorado River, Burnet Co. (Strecker, 1931: 48 [listed as *macrodon*, not seen]); Colorado River, Austin (MCZ) and Webberville (USNM); *both* Travis Co.; Colorado River, Colorado Co. (Strecker, 1931: 48 [listed as *macrodon*, not seen]); Colorado River, Wharton, Wharton Co. (MCZ).

BRAZOS RIVER SYSTEM

BRAZOS RIVER DRAINAGE.-- *Texas*: [Brazos River] Stephens Co. (Howells, *et al.*, 1996: 144 [listed as *macrodon*]).

BOSQUE RIVER DRAINAGE.-- *Texas*: North Bosque River (MCZ) and China (USNM); Bosque River (Strecker, 1931: 48 [listed as *macrodon*, not seen]); *all* McLennan Co.

BRAZOS RIVER DRAINAGE.-- *Texas*: Aquilla Creek (Strecker, 1931: 48 [listed as *macrodon*, not seen]); Walkers Crossing [not located] (MCZ); [Brazos River] Waco (Strecker, 1931: 48 [listed as *macrodon*, not seen]); *all* McLennan Co.

LITTLE RIVER DRAINAGE.-- *Texas*: Leon River, Coryelle Co. (Strecker, 1931: 48 [listed as *macrodon*, not seen]). Brushy Creek, Thorndale, Milan Co. (USNM).

BRAZOS RIVER DRAINAGE.-- *Texas*: Brazos River, Robertson Co. (Strecker, 1931: 48 [listed as *macrodon*, not seen]). Brazos River, 11 mi SW Bryan, Brazos Co. (MCZ); race canal, nr. Ancola, Fort Bend Co. (Howells, *et al.*, 1996: 143, figs.)

TRINITY RIVER SYSTEM

TRINITY RIVER DRAINAGE.-- *Texas*: Trinity River; Elm Fork of Trinity River, nr. Owens Ferry, *both* Dallas Co. (*both* USNM); Chambers Creek of Trinity River, Navarro Co. (Strecker, 1931: 48 [listed as *donaciformis*, not seen]).

SAN JACINTO RIVER SYSTEM

SAN JACINTO RIVER DRAINAGE.-- *Texas*: San Jacinto River, Montgomery Co. (Murray [in] Howells *et al.* 1996: 142 [listed as *donaciformis*, not seen])

NECHES RIVER SYSTEM

NECHES RIVER DRAINAGE.-- *Texas*: Neches River, Smith Co. (Strecker, 1931: 48 [listed as *donaciformis*, not seen]); Neches River, Rockland (UMMZ) and Town Bluff (MCZ), *both* Tyler Co., Neches River, Silsbee, Hardin Co. (Vidrine 1993, pl. 18, figs M-O).

SABINE RIVER SYSTEM

SABINE RIVER DRAINAGE.-- *Texas*: Sabine River, Smith Co. (USNM) Sabine River, Panola Co. (Howells *et al.*, 1996: 146 [not seen]). *Louisiana*: Sabine River, 18 mi SW Many, Sabine Parish (MCZ); Sabine River, Burr Ferry, Verona Parish (MCZ).

CALCACIEU RIVER SYSTEM

CALCACIEU RIVER DRAINAGE.-- *Louisiana*: Whiskey Chitto Creek; [Lake Charles]; (*both* Vidrine 1993, based on map 129).

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Key to the principal river systems mentioned in text.

Western Gulf Coastal Region

RIO GRANDE SUBPROVINCE

- | | |
|----------------------------|-----------------------------|
| a. Rio Grande System | 3. San Antonio River System |
| b. San Jose River | 4. Guadalupe River System |
| c. Pecos River | 5. Colorado River System |
| d. Lake McMillan Reservoir | 6. San Saba River Drainage |
| e. Rio Conchos | 7. Llano River Drainage |
| f. Amistad Reservoir | 8. Brazos River System |
| g. Devils River | |

Sabine Subprovince

- | | |
|--------------------|-----------------------------|
| Pinto Creek* | 9. San Jacinto River System |
| h. Las Moras Creek | 10. Trinity River System |
| Elm Creek* | 11. Neches River System |
| San Lorenzo Creek* | 12. Sabine River System |
| San Isabell Creek* | 13. Calcasieu River System |

- | | |
|---------------|--|
| i. Rio Salado | |
|---------------|--|

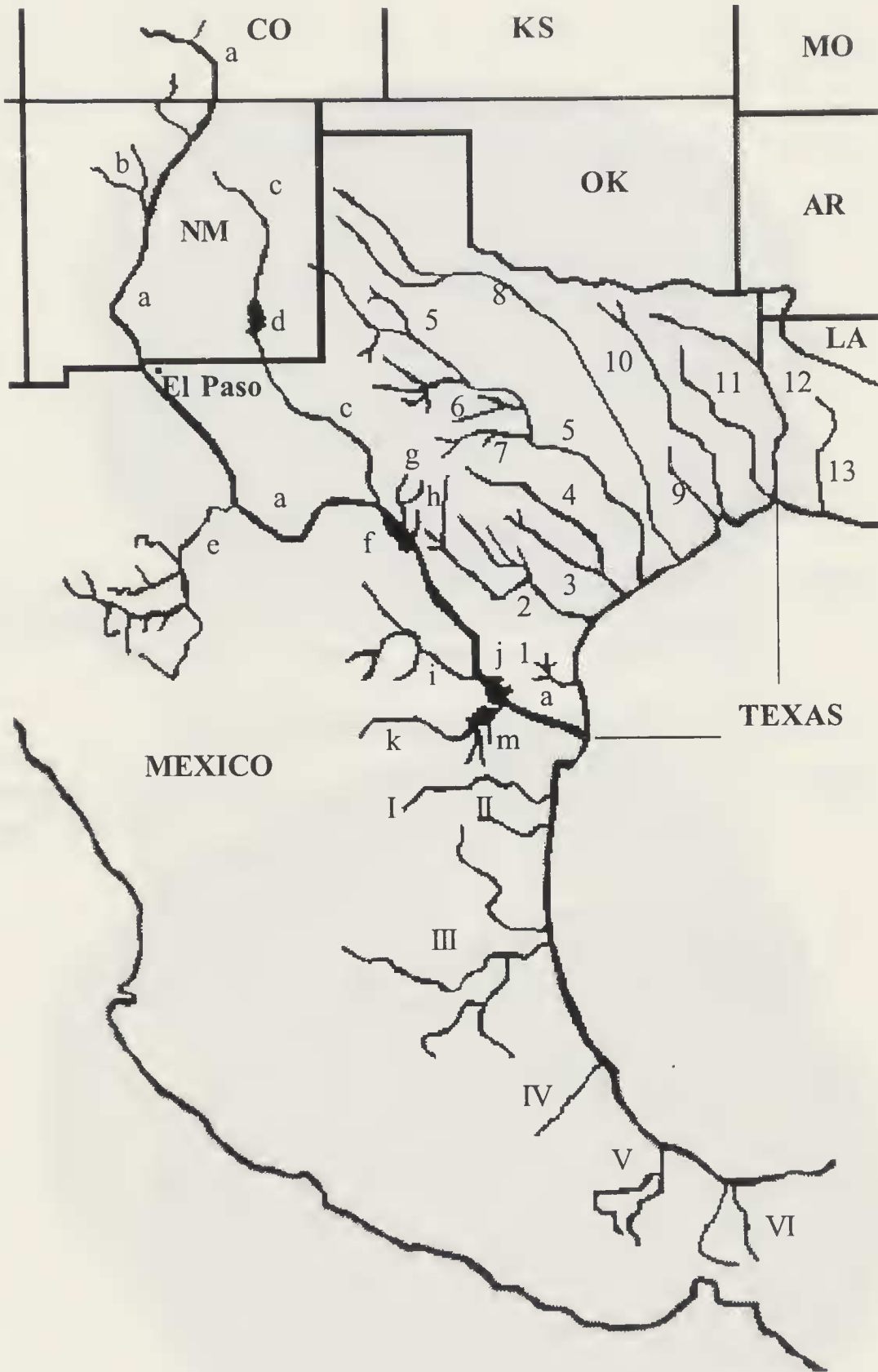
Mexican Gulf Coastal Region

- | | |
|-----------------------|---|
| j. Falcon Reservoir | I. Rio Conchos (or Rio San Fernando) System |
| k. Rio San Juan | II. Rio Sota de Marina System |
| m. Presa de El Azucar | III. Rio Tamesi System |
| | IV. Rio Cazonces System |

CENTRAL TEXAS SUBPROVINCE

- | | |
|--------------------------|---------------------------|
| 1. Baffin Drainage Basin | V. Rio Cotaxla System |
| 2. Nueces River System | VI. Rio Panaloapan System |

* In Table by order of appearance in text, but not indicated on Map 1.



Map 1

(The above map is an adumbration of the principal river systems mentioned in the text and listed in Table 2.)

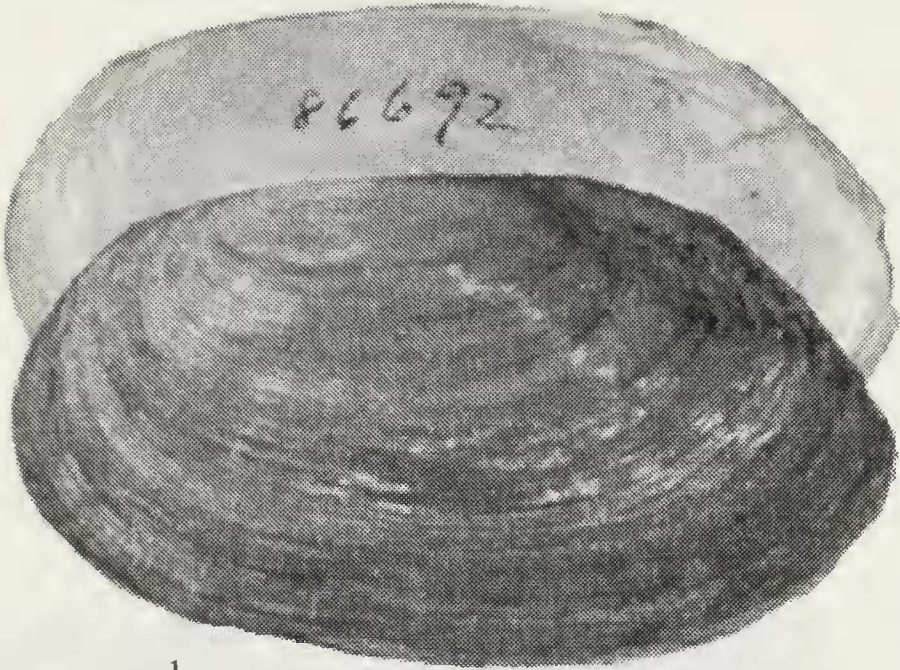
Plate 1

Anodonta (Utterbackia) imbecillis Say, 1829

Fig. 1. *Anodonta henryana* Lea, 1857. Matamoras, State of Tamulipas, Mexico. Lectotype USNM 86692. Length 72.5 mm, height 39.5 mm, width 26 mm (approx. 1.25x).

Meglonaias nervosa (Rafinesque, 1820)

Fig. 2. *Unio eightsii* Lea, 1860. Sabinas River, State of New [Nuevo] Leon, Mexico. Lectotype USNM 83991. Length 117 mm, height 85 mm, width 45.5 mm (approx. nat. size).



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2

Plate 1

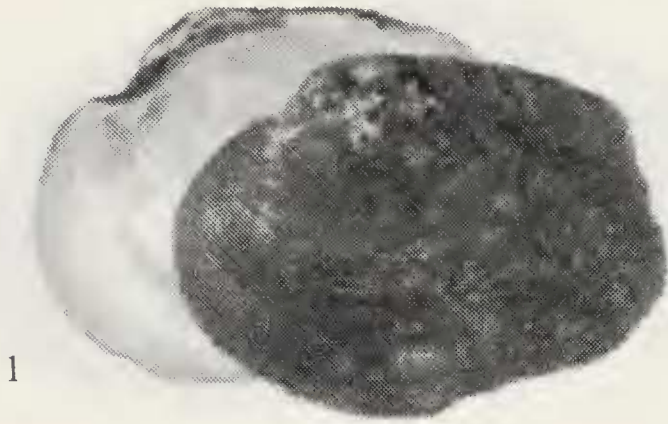
Plate 2

Quadrula (Quadrula) conchiana (Lea, 1860)

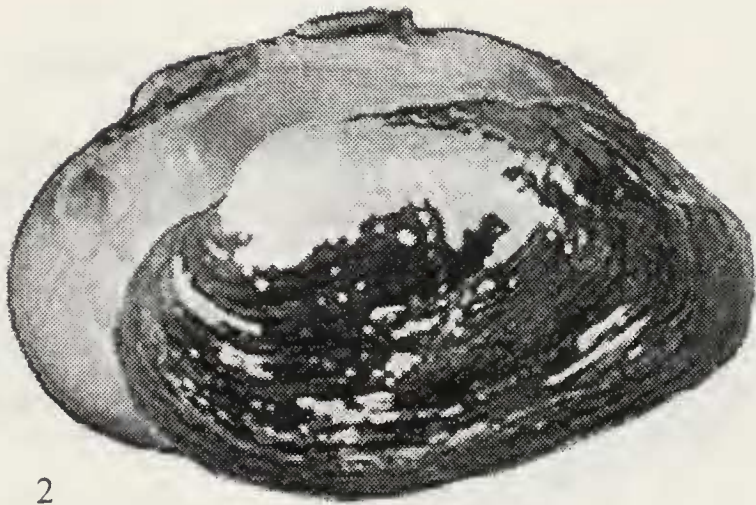
- Fig. 1. *Unio couchianus* Lea, 1860. Rio Salado. [State of] New [Nuevo] Leon. Mexico. Lectotype USNM 85728. Length 47 mm, height 35 mm, width 25 mm (approx. 1.5x).

Quincuncina mitchelli (Simpson, 1895)

- Fig. 2. *Unio mitchelli* Simpson, 1895. Guadalupe River, Victoria Co., Texas. Lectotype USNM 128364. Length 54 mm, height 32.5 mm, width 21 mm (approx. 1.5x).
- Fig. 3. *Unio mitchelli elongatus* Simpson, 1914. Guadalupe River, near Kerrville, Kerr Co., Texas. Lectotype USNM 128364. Length 84 mm, height 46 mm, width 28 mm (approx. nat. size).



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Plate 2

Plate 3

Quincuncina mitchelli (Simpson, 1895)

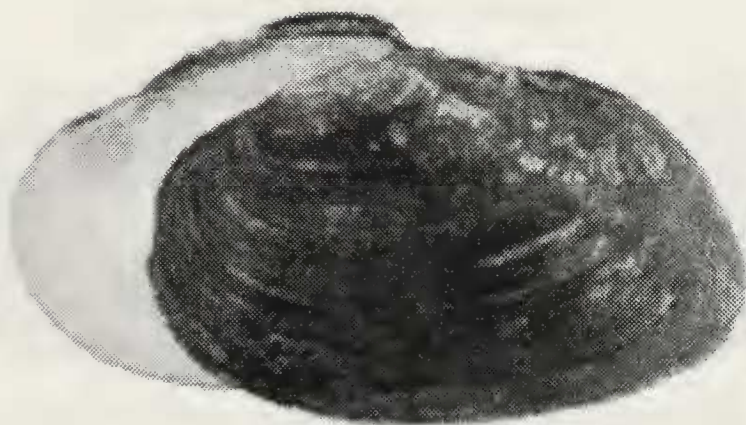
- Fig. 1. *Unio iheringi* B.H. Wright, 1896. San Saba River, Menard Co., Texas. Lectotype USNM 152171. Length 52 mm, height 34 mm, width 20 mm. (approx. 1.5x).
- Fig. 2. *Quadrula* (*Quincuncina*) *guadalupensis* Wurtz, 1950. Guadalupe River, above Seguin, Guadalupe Co., Texas. Holotype ANSP 185974. Length 51 mm, height 32.3 mm, width 17.1 mm

Toxolasma parvus (Barnes, 1823)

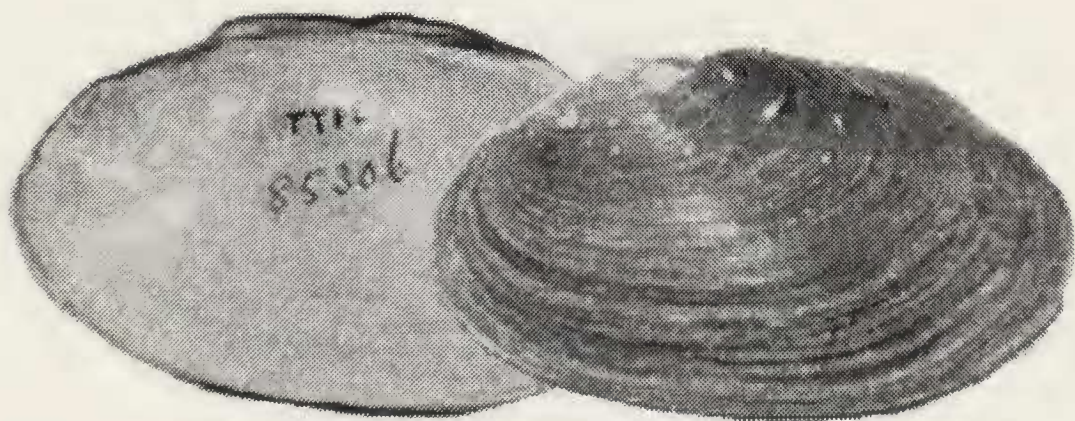
- Fig. 3. *Unio haleianus* Lea, 1842. [Red River], Alexandria, [Rapides Parish, Louisiana]. Holotype USNM 85306 [male]. Length 69 mm, height 39 mm, width 25 mm. (approx. 1.5x).



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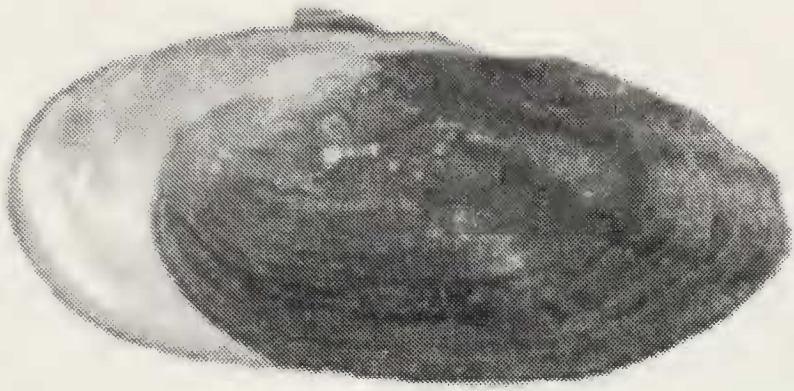
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Plate 3

Plate 4

Toxolasma parvus (Barnes, 1823)

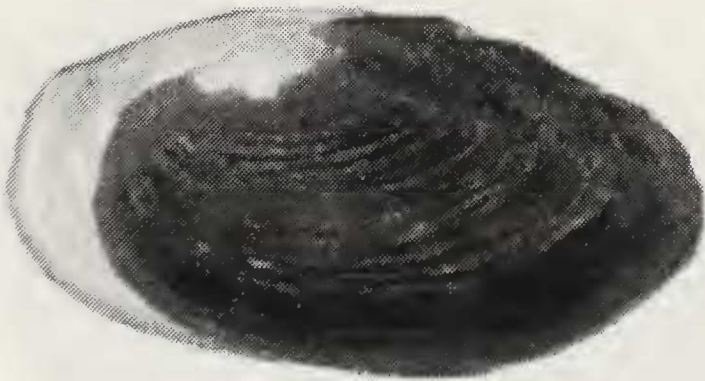
- Fig. 1. *Unio texasensis* Lea, 1857. [Guadalupe River], Dewitt Co., Texas). Holotype USNM 85302 [male]. Length 37 mm, height 19 mm, width 13 mm. (approx. 1.5X).
- Fig. 2. *Unio bardianus* Lea, 1857. Devils River [Val Verde Co.], Texas. Figured type [lost, female]. Length 41 mm, height 23 mm, width 14 mm (natural size), from Lea (approx. nat. size).
- Fig. 3. *Unio bealei* Lea, 1862. [Trinity River], Leon Co., Texas. Holotype USNM 85305 [male]. Length 45 mm, height 26 mm, width 15 mm (approx. 1.5X).



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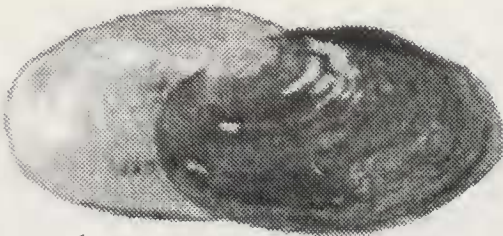
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Plate 4

Plate 5

Toxolasma parvus (Barnes, 1823)

- Fig. 1. *Lampsilis texasensis compressus* Simpson, 1900. Las Moras Creek, Fort Clark [=Brackettville, Kinney County], Texas. Lectotype USNM 152059 [male]. Length 41.5 mm, height 25 mm, width 12 mm (approx. 1.5X).
- Fig. 2. *Lampsilis mearnsi* Simpson, 1900. [Las Moras Creek, a pool about 20 mi. S] Fort Clark[Brackettville, Kinney County], Texas. Holotype USNM 151549 [male]. Length 52 mm, height 34 mm, width 22.5 mm (approx. 1.5X).
- Fig. 3. *Ibid.* Allotype [also] USNM 151549. Length 54 mm, height 31 mm, width 22 mm (approx. 1.5X).



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Plate 5

Plate 6

Popenaias popei (Lea, 1857)

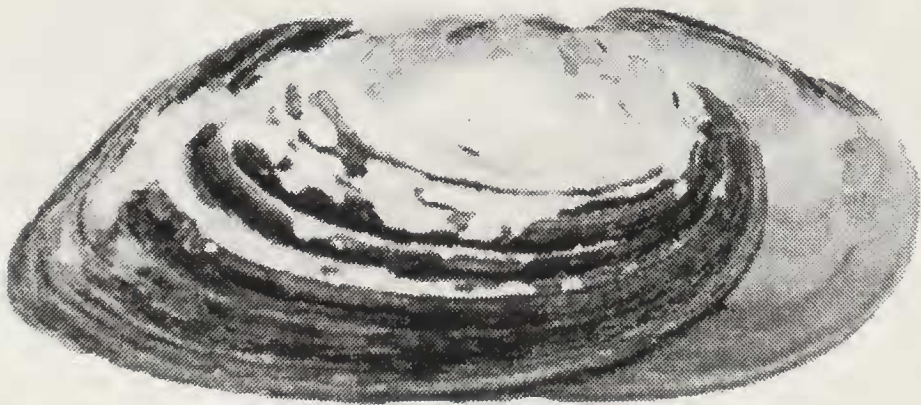
- Fig. 1. *Unio popei* Lea, 1857. Rio Salado, State of New [Nuevo] Leon, Mexico. Lectotype USNM 85859. Length 58.5 mm, height 28 mm, width 15 mm (approx. 1.5X).

Unio merus tetralasmus (Say, 1831)

- Fig. 2. *Unio manubius* Gould, 1855 [Rio Agualeguas, Puntiaquedo ca. 5 km NE General Trevino, State of Nuevo Leon, Mexico]. Lectotype MCZ 169447. Length 94 mm, height 46 mm, width 31 mm (approx. nat. size).



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Plate 7

Truncilla donaciformis (Lea, 1828)

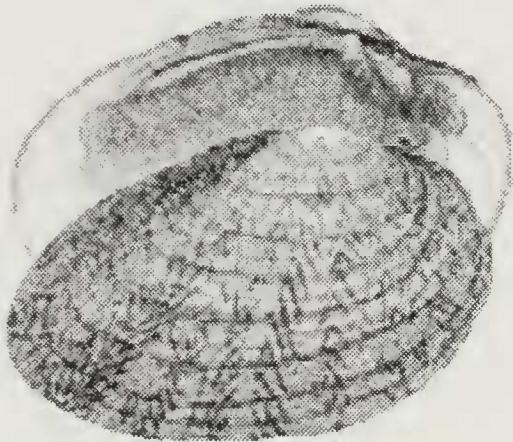
- Fig. 1. *Unio donaciformis* Lea, 1828. Ohio. Paralectotype USNM 84457 [male]. Length 45 mm, height 28 mm, width 18 mm (approx. nat. size), [larger than the lectotype which measures: length 38 mm, height 25 mm, width 18 mm].
- Fig. 2. *Ibid.* Allotype [also] USNM 84457. Length 42 mm, height 30 mm, width 19 mm (approx. nat. size).
- Fig. 3. *Unio zigzag* Lea, 1829. Ohio. Figured type [lost, male]. Length 38 mm, height 23 mm, width 15 mm (natural size), from Lea (approx. nat. size).
- Fig. 4. Rio Salado, Nuevo Lorado, [State of] Tamaulipas. USNM 85004a. [single valve only]. Length 24 mm, height 17 mm, width 12 mm (approx. nat. size).
- Fig. 5. *Unio cognatus* Lea, 1860. Rio Salado [State of] New [Nuevo] Leon, Mexico. Holotype USNM 85004 [probably female, single valve only]. Length 44 mm, height 28.5 mm, width 20 mm (approx. nat. size).
- Fig. 6. *Unio macrodon* Lea, 1859. [Colorado River]. Rutersville, [Fayette Co.], Texas. Holotype USNM 25714 [male, unmatched valves]. Length 48 mm, height 25.5 mm, width 10 mm (approx. nat. size).



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6

TAXA OMITTED FROM "UNIONACEA" BY FRITZ HAAS, 1969

Richard I. Johnson

While searching for the type species of *Arotonaias* Martens 1900, Kabat and Boss (1997: 104) noted that this generic name was not included in the monumental compendium on the Unionacea by Haas (1969) which was meant to be complete to that date. Haas based his classification of the North and Central American species mostly on the work of Frierson (1927), which was then the latest synthesis. He inadvertently skipped over *Arotonaias*, which had appeared on the top of page 92, and missed the three species listed under it, and, of course, its type species, *Unio cyrenoides* Philippi 1847, selected by subsequent designation (Frierson, 1927: 11). The missing taxa, with their synonyms, which were also omitted, are listed below.

Arotonaias cyrenoides (Philippi, 1847)*Unio cyrenoides* Philippi.*Unio sagrinatus* Sowerby, 1868.*Unio newcombianus* Lea, 1856.*Unio gabbianus* Martens (non Lea) 1900, p. 498 pl. 39, figs. 5, 5a, 5b*Arotonaias imbricata* (Morch, 1860)*Unio imbricatus* Morch.*Unio encarpus* Lea, 1868.*Arotonaias gabbiana* (Lea, 1868)*Unio gabbianus* Lea.*Unio nicaraguaensis* Lea, 1868.

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